ACC.13
62nd Annual Scientific Session & Expo
TCT@ACC-i2

E1098
JACC March 12, 2013
Volume 61, Issue 10

Imaging

REAL-TIME 3D INTRACARDIAC ECHO OF THE MITRAL VALVE USING A NOVEL LIVE VOLUMETRIC IMAGING CATHETER

Poster Contributions
Poster Sessions, Expo North
Monday, March 11, 2013, 9:45 a.m.-10:30 a.m.

Session Title: Imaging: Echo XV
Abstract Category: 18. Imaging: Echo
Presentation Number: 1313-344

Authors: *David Dausch, John Castellucci, Kristin Gilchrist, James Carlson, Stephen Hall, Olaf von Ramm, RTI International, Research Triangle Park, NC, USA, Duke University, Durham, NC, USA*

Background: Real-time 3D echo can provide greater accuracy for guidance of transcatheter mitral valve therapy. Current 3D transesophageal echo probes require patient anesthesia and intubation as well as additional personnel (e.g., anesthesiologist, echocardiographer) during the procedure which can increase procedural risk and cost. Real-time 3D intracardiac echo (ICE) catheters are not widely available in part due to manufacturability and performance limitations of traditional piezoelectric transducers for catheter probes.

Methods: Prototype Live Volumetric Imaging (LVI) ICE catheters were fabricated. The 14F catheters contained novel piezoelectric micromachined ultrasound transducer (pMUT) matrix phased arrays with 256 elements and integrated signal cabling. In vivo images were obtained in an adult swine by advancing the ICE catheter from the jugular vein and superior vena cava into the right ventricle or from the femoral vein and inferior vena cava into the right atrium for ICE imaging of the left ventricle and mitral valve. Images were acquired with a prototype volume ultrasound imaging system.

Results: This experiment demonstrated the first ICE catheter providing true real-time 3D intracardiac ultrasound imaging with the combined desired features of full volume views (up to 80x80 degrees), deep scan depth (8-10 cm), high frame rate (20-30 volumes per second) and good resolution. Volume views showed the ability to concurrently obtain left ventricular long axis and short axis views, including side and en face views of the mitral valve, respectively, within one volume loop and requiring no mechanical repositioning of the catheter. B-mode long axis left ventricular views required positioning the catheter in the right ventricle, whereas short axis views required catheter positioning in the right atrium.

Conclusions: The LVI ICE catheter proves feasibility of integrating matrix phased arrays with good performance in catheter probes for true real-time 3D intracardiac imaging. We propose that this catheter can provide the needed volume views of the mitral valve using the more preferred transcatheter approach for interventional imaging.